PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2000-252076

(43)Date of publication of application : 14.09.2000

(51)Int.Cl. H05B 33/22
H05B 33/10
H05B 33/14
// C09K 11/06

(21)Application number : 11-054980

(22)Date of filing : 03.03.1999

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(54) ORGANIC ELECTROLUMINESCENCE ELEMENT AND ITS MANUFACTURE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an organic electroluminescence element capable of forming an upper layer organic film containing an electron transportable polymer on a lower layer organic film without impairing the lower layer organic film even if a wet process is used.

SOLUTION: The electroluminescence element has an anode layer acting as an anode; a cathode layer acting as a cathode; and at least one layer of the anode layer and the cathode layer is made of a transparent material, a hole transport layer and an electron transport layer are arranged between the anode layer and the cathode layer, the hole transport layer contains a hole transportable organic material, the electron transport layer is formed by a wet process and contains an electron transportable polymer, and the electron transportable polymer contains 1-5 side chains comprising an alkyl group or an alkoxy group in a repeating unit.

LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or

application converted registration]

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[Date of requesting appeal against examiner's decision of rejection]

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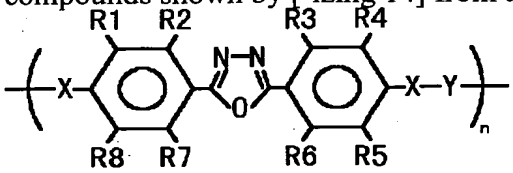
* NOTICES *

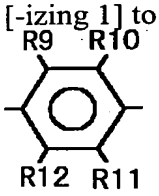
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

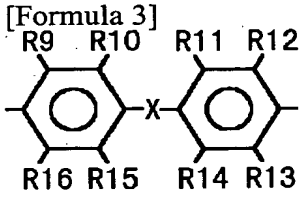
[Claim(s)]
[Claim 1] Here with an anode plate layer which acts as an anode plate, and catholyte which acts as cathode A method of one consists of a transparent material at least among said anode plate layers and said catholytes, and it has an electron hole transportation layer and an electronic transportation layer between said anode plate layers and said catholytes. Said electron hole transportation layer It is the organic electroluminescent element which contains a side chain with which said electronic transportability macromolecule consists of an alkyl group or an alkoxyl group into a repeat unit here including an electronic transportability macromolecule five or less [1 or more] by forming said electronic transportation layer by wet method including the electron hole transportability organic substance.
[Claim 2] Said electronic transportability macromolecule consists of either of the high molecular compounds shown by [-izing 14] from a chemical formula [-izing 1] or [-izing 12], [Formula 1]



or [[-izing 2] and [-izing 3] which show the chemical structure shown by Y among a chemical formula [-izing 1] to structure nothing or the following, and ********] -- from -- becoming [Formula 2]



[Formula 3]



The chemical structure shown by X consists of either among [-izing 4], [-izing 5], [-izing 6], [-izing 7], [-izing 8], [-izing 9], [-izing 10], and [-izing 11] which are shown below, [Formula 4]

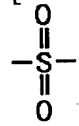
[Formula 5]

[Formula 6]

[Formula 7]

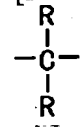
[Formula 8]

[Formula 9]



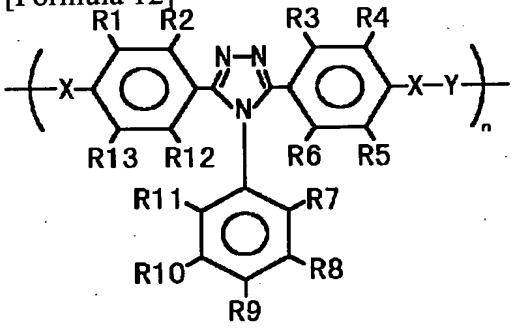
[Formula 10]

[Formula 11]

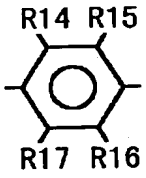


R shows an alkyl group. Each of R1-R16 Independently, hydrogen, an alkyl group, an alkoxyl group, a fluorine, chlorine, and an aryl group are shown, or it sets to/and adjoining Rn (integer which n becomes from or more 1 16 or less either), respectively. A ring may condense, you may have an alkyl group, an alkoxyl group, a fluorine, chlorine, and an aryl group as the above-mentioned aryl group and a substituent of a fused aromatic ring further, and the sum total of the above-mentioned alkyl group and an alkoxyl group consists of 1-5 pieces.

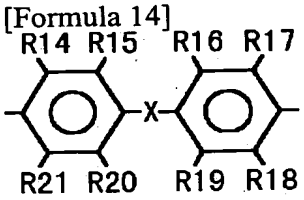
[Formula 12]



the chemical structure shown by Y among a chemical formula [-izing 12] is shown in structure nothing or the following -- or [[-izing 13], [-izing 14], and ********] -- from -- becoming [Formula 13]

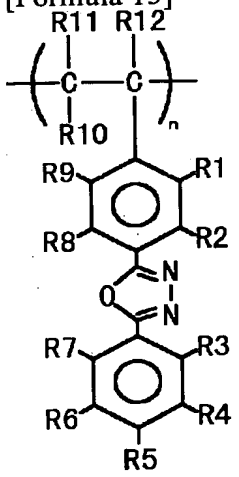


[Formula 14]



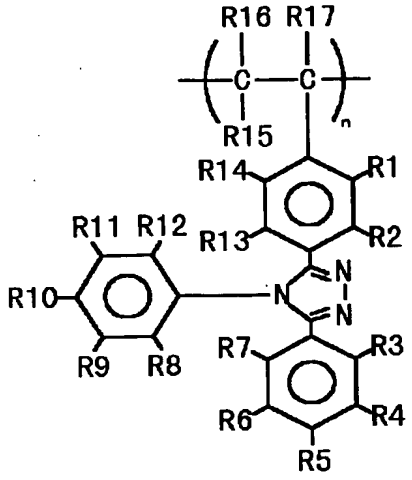
The chemical structure shown by X The above-mentioned [-izing 4], [-izing 5], [-izing 6], [-izing 7], It consists of either among [-izing 8], [-izing 9], [-izing 10], and [-izing 11], and R shows an alkyl group. Each of R1-R21 Independently, hydrogen, an alkyl group, an alkoxyl group, a fluorine, chlorine, and an aryl group are shown, or it sets to/and adjoining Rn (integer which n becomes from or more 1 21 or less either), respectively. A ring may condense, you may have an alkyl group, an alkoxyl group, a fluorine, chlorine, and an aryl group as the above-mentioned aryl group and a substituent of a fused aromatic ring further, and the sum total of the above-mentioned alkyl group and an alkoxyl group consists of 1-5 pieces.

[Formula 15]



(Each of R1-R17 among a chemical formula [-izing 15]) Independently, hydrogen, an alkyl group, an alkoxyl group, a fluorine, chlorine, and an aryl group are shown, or it sets to/and adjoining Rn (integer which n becomes from or more 1 17 or less either), respectively. A ring may condense, you may have an alkyl group, an alkoxyl group, a fluorine, chlorine, and an aryl group as the above-mentioned aryl group and a substituent of a fused aromatic ring further, and the sum total of the above-mentioned alkyl group and an alkoxyl group consists of 1-5 pieces.

[Formula 16]



(Each of R1-R17 among a chemical formula [-izing 16]) Independently, hydrogen, an alkyl group, an alkoxyl group, a fluorine, chlorine, and an aryl group are shown, or it sets to/and adjoining Rn (integer which n becomes from or more 1 17 or less either), respectively. A ring may condense, you may have an alkyl group, an alkoxyl group, a fluorine, chlorine, and an aryl group as the above-mentioned aryl group and a substituent of a fused aromatic ring further, and the sum total of the above-mentioned alkyl group and an alkoxyl group consists of 1-5 pieces.
An organic electroluminescent element according to claim 1.
[Claim 3] Said electronic transportation layer is an organic electroluminescent element according to claim 1 or 2 which contains an electronic transportability low-molecular further.
[Claim 4] An organic electroluminescent element given in said electron hole transportation layer or said electronic transportation claims 1-3 layer which contains a fluorescent material in a method of one at least.
[Claim 5] It is an organic electroluminescent element given in either of claims 1-4 which a method of one is a fluorescent material at least, and shows said electronic transportability macromolecule with which said electronic transportability organic substance is contained in said electronic transportation layer here or/of said electron hole transportability organic substance and the electronic transportability organic substance, and said electronic transportability low-molecular.
[Claim 6] An anode plate stratification step which forms on a substrate an anode plate layer which acts as an anode plate, An electron hole transportation stratification step which forms an electron hole transportation layer containing the electron hole transportability organic substance on said anode plate layer, An electronic transportation stratification step which forms an electronic transportation layer on said electron hole transportation layer with a wet method using a solution which dissolved or distributed an electronic transportability macromolecule in a solvent, and here Said electronic transportability macromolecule a catholyte formation step which forms catholyte which acts as cathode on said electronic transportation layer into a repeat unit, including a side chain which consists of an alkyl group or an alkoxyl group five or less [1 or more], and here A manufacture method of an organic electroluminescent element that a method of one consists of a transparent material at least among said anode plate layers and said catholytes.
[Claim 7] Said electronic transportation stratification step is the manufacture method of an organic electroluminescent element which consists of a step which forms an electronic transportation layer on said electron hole transportation layer with a wet method using a solution which dissolved either of the high molecular compounds shown in a solvent by chemical formula [-izing 1], [-izing 12], [-izing 15], or [-izing 16].
[Claim 8] said solvent -- a solubility parameter of said solvent -- soluble [of a solubility parameter of said electron hole transportability organic substance] -- SP={(deltaH-RT) /V} 1/2 to which it is out of range, and solubility of water in a room temperature to said solvent is below the amount percent of

duplexs, and said solubility parameter is expressed with a formula (1) here ..... (1)
(In a formula (1), SPs are solubility parameters (an unit: cal/cm3) 1/2, deltaH is the evaporation heat (an unit: cal/mol) to a solvent, R is a gas constant (an unit: cal/(mol-K)), T is the absolute temperature (an unit: K) of a solvent, and V is the molar volume (an unit: cm3/mol) of a solvent)
A manufacture method of an organic electroluminescent element according to claim 6 or 7.
[Claim 9] Said solvent is the manufacture method of an organic electroluminescent element according to claim 8 that solubility of water in a room temperature is 1 or less percentage by weight.
[Claim 10] Said solvent is the manufacture method of an organic electroluminescent element according to claim 8 or 9 which consists of the weak organic substance of hydrogen bond from a ketone, ester, the ether, alcohol, a carboxylic acid, an amine, and aldehydes.
[Claim 11] Said solvent is the manufacture method of an organic electroluminescent element according to claim 8 or 9 characterized by consisting of at least one kind in a hydrocarbon, halogenated hydrocarbon, a nitration hydrocarbon, and nitril.
[Claim 12] Said electronic transportation layer is the manufacture method of an organic electroluminescent element given in either of claims 6-11 characterized by including an electronic transportability low-molecular further.
[Claim 13] A manufacture method of an organic electroluminescent element given in either of claims 6-12 characterized by thing of said electron hole transportation layer and said electronic transportation layer included for a fluorescent material in a method of one at least.
[Claim 14] It is the manufacture method of an organic electroluminescent element given in either of claims 6-13 which a method of one is a fluorescent material at least, and shows said electronic transportability macromolecule with which said electronic transportability organic substance is contained in said electronic transportation layer here or/of said electron hole transportability organic substance and the electronic transportability organic substance, and said electronic transportability low-molecular.

[Translation done.]